

WHAT IS CLAIMED IS:

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- 10 1. A user interface operable to create, on a display device, a window for displaying a plurality of menu editor items for user selection, said menu editor items comprising:
a sequence editor item for creating a pulse sequence from at least one value; and
a sequence tailor editor item for user interaction with a graphical representation of a selected pulse sequence, wherein during said user interaction, the selected pulse sequence is graphically displayed to the user.
- 10 2. The user interface in accordance with claim 1, wherein said sequence tailor editor item is activated in response to user selection.
- 15 3. The user interface in accordance with claim 1, wherein user selection of said sequence editor item activates a display of at least one sequence parameter for creating said pulse sequence, said at least one sequence parameter being operable to accept a default value.
- 20 4. The user interface in accordance with claim 3, wherein said at least one sequence parameter is operable to accept a user entered value.

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5. The user interface in accordance with claim 3, wherein said at least one sequence parameter is selected from the group consisting of: a gradient resolution parameter, a radio frequency pulse resolution parameter, a echo gathering time parameter, a sequence name parameter, at least one gradient motion compensation parameter, at least 5 one radio frequency pulse characteristic parameter, and at least one data acquisition parameter.
10. 6. The user interface in accordance with claim 3, wherein acceptance, by the user interface, of the at least one sequence parameter activates said sequence tailor editor item.
15. 7. The user interface in accordance with claim 1, wherein activation of said sequence tailor editor item activates display of said pulse sequence and at least one control feature.
8. The user interface in accordance with claim 7, wherein said at least one control feature comprises at least one of a control section, a shape editor, a block editor, and a time scaler.

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9. The user interface in accordance with claim 8, wherein said shape editor, when activated, is operable to modify at least one radio frequency pulse characteristic parameter and the radio frequency pulse shape associated with said selected pulse sequence.

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10. The user interface in accordance with claim 8, wherein said time scaler, when activated, displays at least one vertical line through the graphically displayed selected pulse sequence for assisting the user in analysis of timing relations of the pulse sequence.

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11. The user interface in accordance with claim 1, wherein said graphical representation within said window on said display device is divided into a plurality of portions.

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12. The user interface in accordance with claim 11, wherein said plurality of portions comprises at least one of a radio frequency pulse characteristics graph, a slice select gradient graph, a signal acquisition graph, and a phase encoding graph.

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13. The user interface in accordance with claim 1, wherein said menu editor items within said window further comprise a scan setting menu editor item for initiation of a magnetic resonance imaging scan.

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14. The user interface in accordance with claim 13, wherein selection of said scan setting menu editor item displays at least one type of scan to perform.
- 5 15. The user interface in accordance with claim 14, wherein said at least one type of scan comprises at least one scan selected from the group consisting of: a two dimensional scan, a combination scan, a three dimensional scan, a three dimensional combination scan, a two dimensional fast spin echo scan, and combinations thereof.
- 10 16. The user interface in accordance with claim 14, wherein said type of scan, when activated, displays at least one setting imaging parameter, said setting imaging parameter being operable to accept at least one default value.
- 15 17. The user interface in accordance with claim 16, wherein said at least one setting imaging parameter is operable to accept at least one user-entered value.
18. The user interface in accordance with claim 16, wherein said at least one setting imaging parameter is selected from the group consisting of: a number of slices parameter, a slice thickness parameter, a sequence repetition parameter, a number of phase

encoding levels parameter, a discrete Fourier transform size parameter, a polarity flipping parameter, and combinations thereof.

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19. A method for creation and customization of pulse sequences, said method comprising the steps of:

creating a window on a display device for displaying a plurality of menu editor items for user selection;

displaying a sequence editor item for creating a pulse sequence from at least one of user-entered values and default values;

10 displaying a sequence tailor editor item for user interaction with a graphical representation of a selected pulse sequence; and

displaying, graphically, said pulse sequence to the user.

20. The method in accordance with claim 19, wherein said creating step further comprises the step of:

displaying a scan setting menu editor item for initiation of a magnetic resonance imaging scan.

21. The method in accordance with claim 20, wherein, upon initiation of said 20 magnetic resonance imaging scan, said method further comprises the step of:

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initiating at least one of a two dimensional scan, a two dimensional combination scan, a three dimensional scan, a three dimensional combination scan, and a two dimensional fast spin echo scan.

- 5 22. The method in accordance with claim 19, further comprising the step of:
 dividing said graphical representation within said window on said display device
 into a plurality of portions.
- 10 23. The method in accordance with claim 22, wherein said step of dividing
 further comprises the step of dividing said graphical representation into at least one of a
 radio frequency pulse characteristics graph, a slice select gradient graph, a signal
 acquisition graph, and a phase encoding graph.
- 15 24. The method in accordance with claim 19, said method further comprising
 the steps of:
 initiating a magnetic resonance imaging scan by activating a scan setting menu
 editor item within said window on said display device; and
 displaying at least one setting imaging parameter.

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25. The method in accordance with claim 19, said method further comprising
the steps of:

displaying, in response to selection of said sequence editor item, at least one
sequence parameter for creating said pulse sequence; and

5 accepting, by said at least one sequence parameter, at least one of said default
values.

26. The method in accordance with claim 25, wherein said step of accepting
further comprises the step of:

10 accepting, by said at least one sequence parameter, at least one of said user-entered
values.

27. The method in accordance with claim 26, wherein said step of displaying
said at least one sequence parameter further comprises the step of:

15 displaying at least one additional parameter, said additional parameter selected from
the group consisting of:

a gradient resolution parameter, a radio frequency pulse resolution
parameter, an echo gathering time parameter, a sequence name parameter, a plurality of
gradient motion compensation parameters, a plurality of radio frequency pulse parameters,

20 and a plurality of data acquisition parameters.

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28. The method in accordance with claim 26, said method further comprising
the step of:
activating said sequence tailor editor item by at least one of user selection and a
5 response to said step of accepting of said at least one sequence parameter by a user
interface.
29. The method in accordance with claim 28, said method further comprising
the step of:
10 displaying the selected one of said pulse sequences and at least one control feature
for at least one of plot modification and plot enhancement.
30. The method in accordance with claim 29, wherein said step of displaying
further comprises the step of:
15 displaying at least one of a control section, a shape editor, a block editor, and a time
scaler.
31. The method in accordance with claim 30, wherein said step of displaying at
least one of a control section, a shape editor, a block editor, and a time scaler further
20 comprises the steps of:

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activating said shape editor; and

modifying at least one of the radio frequency pulse characteristic parameters and the radio frequency pulse shape associated with said pulse sequence.

5 32. The method in accordance with claim 30, wherein said step of displaying at least one of a control section, a shape editor, a block editor, and a time scaler further comprises the steps of:

activating said time scaler; and

10 displaying at least one vertical line through the graphically displayed pulse sequence for assisting the user in analysis of timing relations of the pulse sequence.

33. The method in accordance with claim 30, wherein said step of displaying further comprises the step of :

15 displaying at least one of a number of slices parameter, a slice thickness parameter, a sequence repetition parameter, a number of phase encoding levels parameter, a discrete Fourier transform size parameter, and a polarity flipping parameter.

34. A magnetic resonance imaging system for creation and customization of pulse sequences comprising:

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a user interface operable to create, on a display, a window for displaying a plurality of menu editor items for user selection, said menu editor items including:

- a sequence editor item for creating a pulse sequence from at least one of user entered values and default values; and
- 5 a sequence tailor editor item for user interaction with a graphical representation of a selected pulse sequence, wherein during said user interaction, the selected pulse sequence is graphically displayed to the user;
- an input unit coupled to said user interface, said input unit for entering at least one user value and a user selection; and
- 10 a scan controller coupled to a computer and a magnetic resonance imaging unit, said scan controller for providing real time data delivery between said computer and said magnetic resonance imaging unit, said computer for displaying said user interface and transmitting data to said scan controller.
- 15 35. The magnetic resonance system in accordance with claim 34, said system further comprising:
 - a storage unit coupled to said computer for storing at least one numerical representation of at least one pulse sequence.

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36. The magnetic resonance system in accordance with claim 34, said system further comprising:

at least one gradient digital-to-analog converter coupled to said scan controller and at least one gradient coil of said magnetic resonance imaging unit, said at least one gradient 5 digital-to-analog converter being operable to receive digital gradient information from said scan controller and convert said digital gradient information to an analog gradient signal, said analog gradient signal being transmitted to said at least one gradient coil.

37. The magnetic resonance system in accordance with claim 34, said system 10 further comprising:

at least one radio frequency shaper digital-to-analog converter coupled to said scan controller and at least one transmitter coil, said at least one radio frequency shaper digital-to-analog converter being operable to receive digital radio frequency shape information from said scan controller, convert said digital radio frequency shape information to an 15 analog radio frequency shape signal, and modulate said analog radio frequency shape signal on said at least one transmitter coil.

38. The magnetic resonance system in accordance with claim 37, wherein said 20 scan controller further comprises at least one synthesizer operable to control the phase and frequency of modulation of said analog radio frequency shape signal.

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39. The magnetic resonance system in accordance with claim 38, said system further comprising:

at least one receiver coil coupled to said scan controller and operable to receive an
5 echo signal from application of said analog gradient signal and said analog radio frequency
shape signal to a specimen aperture of said magnetic resonance imaging unit, said at least
one synthesizer applying frequency and phase settings to a receiver channel for acquisition
of said echo signal, said frequency and phase settings included in at least one numerical
representation transmitted to said at least one synthesizer from said computer.

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40. A magnetic resonance imaging system for creation and customization of
pulse sequences comprising:

a user interface operable to create, on a display, a window for displaying a plurality
of menu editor items for user selection, said menu editor items including:

15 a sequence editor item for creating a pulse sequence from at least one of
user entered values and default values, and

a sequence tailor editor item for user interaction with a graphical
representation of a selected pulse sequence, wherein during said user interaction, the
selected pulse sequence is graphically displayed to the user;

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a dialog box displayed on said display, said dialog box for inputting at least one of a user value and a user selection; and

a scan controller coupled to a computer and a magnetic resonance imaging unit, said scan controller for providing real time data delivery between said computer and said magnetic resonance imaging unit, said computer for displaying said user interface and transmitting data to said scan controller.

41. The magnetic resonance imaging system in accordance with claim 40, said system further comprising:

10 a storage unit coupled to said computer for storing at least one numerical representation of at least one pulse sequence.

42. The user interface in accordance with claim 40, said system further comprising:

15 at least one gradient digital-to-analog converter coupled to said scan controller and at least one gradient coil of said magnetic resonance imaging unit, said at least one gradient digital-to-analog converter being operable to receive digital gradient information from said scan controller and convert said digital gradient information to an analog gradient signal, said analog gradient signal being transmitted to said at least one gradient coil.

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43. The magnetic resonance imaging system in accordance with claim 40, said system further comprising:

at least one radio frequency shaper digital-to-analog converter coupled to said scan controller and at least one transmitter coil, said at least one radio frequency shaper digital-to-analog converter being operable to receive digital radio frequency shape information from said scan controller, convert said digital radio frequency shape information to an analog radio frequency shape signal, and modulate said analog radio frequency shape signal on said at least one transmitter coil.

10 44. The magnetic resonance imaging system in accordance with claim 43, wherein said scan controller further comprises at least one synthesizer operable to control the phase and frequency of modulation of said analog radio frequency shape signal.

15 45. The magnetic resonance imaging system in accordance with claim 44, said system further comprising:

at least one receiver coil coupled to said scan controller and operable to receive an echo signal from application of said analog gradient signal and said analog radio frequency shape signal to a specimen aperture of said magnetic resonance imaging unit, said at least one synthesizer applying frequency and phase settings to a receiver channel for acquisition

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of said echo signal, said frequency and phase settings included in at least one numerical representation transmitted to said at least one synthesizer from said computer.